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ABSTRACT

The effect of a basic competency education program on the achievement of high, average, and low-achieving students was examined for the Alabama Basic Competency Education program (BCE). California Achievement Tests scores in reading, mathematics, and language were examined for 3 years prior to initiation of the BCE program and for 3 years afterward. Three analyses were conducted: (1) statewide achievement levels, in terms of normal curve equivalents (NCE), were analyzed before and after BCE; (2) school systems were categorized as high-achieving, average-achieving, or low-achieving, and NCEs were analyzed for each type of system before and after BCE; and (3) individual students classified as above average, average, or below average were analyzed for 3 years following BCE. CAT scores for 1974-1976 represented the achievement levels prior to BCE while 1981-1983 scores represented achievement levels after BCE; data were not available for 1977-1978 and 1979-1980, which were considered to be transitional implementation years. Results indicated significant improvement in student achievement concomitant with the initiation of the BCE program, especially for the first and second analyses. The third analysis indicated decreasing achievement from 1981 to 1983 and an increase from 1983 to 1984. (GDC)

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THE RELATIONSHIP OF A BASIC COMPETENCY EDUCATION PROGRAM TO OVERALL STUDENT ACHIEVEMENT: A STATE PERSPECTIVE

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ABSTRACT

THE RELATIONSHIP OF A BASIC COMPETENCY EDUCATION PROGRAM TO OVERALL STUDENT ACHIEVEMENT: A STATE PERSPECTIVE

Achievement testing in schools has been a prominent issue for many years. In the last decade, minimum competency testing has come to the forefront in response to a call for accountability in education in the United States. Research to date has shown no clear indication of whether such an emphasis is having a meritorious or deleterious effect on student achievement. The research that has been conducted, albeit with small populations (school districts), has indicated a somewhat positive effect. The issue of whether basic competency education programs, while aimed at lower achieving students can, in fact, enhance the educational achievement of higher achieving students is the subject of intense debate. The Alabama Basic Competency Education (BCE) program has been in place for several years, thus allowing the effects on overall achievement to be studied. This study examined the relationship between student achievement prior to and following the initiation of the Alabama Basic Competency Education program for students in grades four, eight and ten in Alabama public schools.

METHODOLOGY

California Achievement Test scores for three years prior to and following the initiation of the BCE program were used to indicate the relationship between the BCE program and overall student achievement. The subject area test results for reading, language, and mathematics were analyzed separately for each grade and year under investigation.

Test scores were analyzed separately for the entire state as well as for school systems identified as high-achieving, average-achieving, and low-achieving systems. This stratification allowed for the investigation of differential trends in achievement that may have occurred within each type of system. Student data within these systems were also analyzed to determine if results for students who are classified as above average, average, or below average were consistent with the system results. Because of the varying nature of a state testing program, student level analyses were conducted for grades two, four and five. These grade levels allowed for the identification of above average, average and below average students in the first testing year and their analysis in subsequent years.

Data Analysis

Descriptive statistics were calculated for each subject area and for each year under investigation. All achievement data were converted to normal curve equivalents (NCEs) for all analyses. The investigation of state level trends was conducted using a complete randomized block design, where school systems were blocked. From this analysis a significant effect for years was indicated and Tukey's Honestly Significant Difference method was used to test the differences in the means for years.

The investigation of system trends for high-, average-, and low-achieving systems was conducted using a split plot factorial design. The type of system was analyzed across years with the systems blocked within type. In this design, systems were nested within type and the analysis was conducted to estimate the effects for years, type of system, and the interaction of these two. From these analyses, a significant interaction between years and type of system was detected. The simple effects from the interaction were tested to determine if there were significant differences in mean scores across years within type of system. These analyses revealed significant differences for each grade and each subject for each type of system. Because of these results, Tukey's Honestly Significant Difference method was used to test the differences in means by type of system across years.

The investigation of student trends for above-average, average and below-average students also was conducted using a split plot factorial design. The type of student was analyzed across years with the student blocked within type. In this design, students were nested within type and the analysis was conducted to estimate the effects for years, type of student, and the interaction of these two.

RESULTS

There appeared to be a significant change in student achievement concomitant with the initiation of the BCE program. This was true when systems were considered and state averages used. It was also true when systems were stratified into the three achievement levels. In the years following the initiation of the BCE program, there was a significant increase in the achivement levels and this upward trend has continued throught 1984.

The results of the analysis of variance, complete randomized block design, for the statewide data were consistent for all grades and all subjects and indicated significant differences between the means of the post-initiation years and the pre-initiation years. In the post data there was a significant difference and an increase in test scores for each succeeding year resulting in all subject areas in every grade being above the national average except 10th-grade reading which was at the 49.46 NCE. Means for pre-initiation years showed no significant differences between years.

There was a dramatic upward shift in means between pre-initiation and post-initiation years. It was expected that there may be an initial jump in scores due to a possible Hawthorne effect associated with the implementation of the program. The shift was not temporary, however, and means continued the upward trend, lending support to a more permanent change than expected. The means for post-initiation years were statistically significantly higher than those for pre-initiation years. These data suggest that student achievement is higher than expected based on achievement in pre-initiation years.

The results of the analysis of variance, split plot factorial design, for systems classified as low, average and high achieving, indicated significant changes were occurring in mean achievement from pre-initiation years to post-initiation years in all three achievement strata. The high achieving systems were within five NCEs of the national average during the pre-initiation years in all subjects and grades. By 1984, all means were above an NCE of 60 except 10th-grade reading which was an NCE of 59.16. The means for the average-achieving systems were below the national average during the pre-initiation years and ranged from an NCE of 36 to an NCE of 46. In 1984, all means for the average-achieving systems were above the national average. During the pre-initiation years, the means for all subjects and grades for low-achieving systems did not

exceed an NCE of 37 and had a low NCE of 23.59 (the 10th percentile). By 1984, these means had increased to the point where two means, fourth-grade mathematics and language, were above the national average, and all remaining means were above an NCE of 41 (the 34th percentile).

The data for students classified as above average, average or below average are being analyzed and it is expected that these results will be consistent with all analyses conducted thus far. These analyses use student data from the first post-initiation year to identify and classify students as above average, average or below average based on their percentile rank on the total reading subtest of the CAT. Since it is necessary to match student performance over years and statewide testing varies from year to year, the student data are from grades two, four and five. The results of the student level analyses will be reported in a similar fashion to the stratified system results.

Although there were many factors that may have contributed to the rise in achievement during these years, the BCE program seems to have been significant among them. There has been a long-held fear that an emphasis on minimum skills would become maximum expectations for students. Since the initiation of the BCE program in Alabama, there

has been no plateau effect or negative effect on overall achievement for the state as a whole or for groups identified as high achieving, average achieving, and low achieving. In fact, the data in this study seem to support the contention that a quality BCE program has a positive relationship with overall student achievement.

THE RELATIONSHIP OF A BASIC COMPETENCY EDUCATION PROGRAM TO OVERALL STUDENT ACHIEVEMENT: A STATE PERSPECTIVE

INTRODUCTION

Achievement testing in schools has been a prominent issue for many years. In the last decade, minimum competency testing has come to the forefront in response to a call for accountability in education in the United States (National Association of Secondary School Principals [NASSP], 1976; Ogden, 1979). Research to date has shown no clear indication of whether such an emphasis is having a meritorious or deleterious effect on student achievement (Ebel, 1978; Ogden, 1979; Pipho, 1980). The research that has been conducted, albeit with small populations (school districts), has indicated a somewhat positive effect (Brunton, 1982; Trent & Golden, 1981). The issue of whether basic competency education programs, while aimed at lower achieving students can, in fact, enhance the educational achievement of higher achieving students is often clouded with preconceived notions that such cannot be the case. What is needed, and what is admittedly missing, is a direct investigation on a larger scale.

The Alabama Basic Competency Education program (BCE) has been in place for several years, thus allowing the effects on overall achievement to be studied. While other factors and spin-offs of the program should be considered, examining norm-referenced testing data is the only formal measurable means of investigation at this time. Thus, this study examined the relationship between student achievement (California Achievement Test scores in Reading, Mathematics and Language) and the initiation of the Alabama Basic Competency Education program.

METHODOLOGY

Three types of analyses were undertaken to investigate the relationship between the Basic Competency Education program and student achievement on the California Achievement Test (CAT). In the first analysis, statewide achievement levels, in terms of Normal Curve Equivalents (NCEs) were analyzed for three years prior to the initiation of the BCE program and for three years following the initiation of the program. For the second analysis, school systems were stratified according to their relative standing within the state and were categorized as high-achieving, average-achieving, or low-achieving systems. The achievement levels, in NCEs, for each type system were then analyzed both prior to and following the initiation of the BCE program.

California Achievement Test scores from the years 1974, 1975 and 1976 were used to indicate achievement levels prior to the initiation of the BCE program. Scores on the CAT from 1981, 1983 and 1984 were used to indicate achievement levels after the initiation of the Basic Competency Education program. These years were investigated due to the nature of a statewide testing program. For example, in 1977, no statewide testing was conducted, while in 1978, only grades 2, 4, 6 and 8 were tested.

The years 1979 and 1980 were considered transitional years for the implementation of the BCE program in Alabama. This was assumed because this was the period of initiation of the program and the analysis of the data from 1979 indicated a major upward trend in achievement levels in all three grades, in all three subject areas. This was not unexpected because of a possible Hawthorne effect due to the emphasis on and newness of the program. Considering test scores from 1979 and 1980 as transtional allowed for the investigation of stabilized trends before and after

initiation of the BCE program. Scores from 1974, 1975, and 1976 were derived from the 1970 edition of the CAT whereas scores from 1981, 1983, and 1984 were derived from the 1977 edition; therefore, the scores based on the 1970 edition were equated to the 1977 edition for all analyses.

In the third analysis, individual student data, in NCEs, for students classified as above average, average, or below average on the California Achievement Test were analyzed for three years following the initiation of the BCE program. Data at the student level are not available for the years prior to the initiation of the BCE program and, therefore, only post-initiation performance was investigated.

Procedures - Analysis 1

Descriptive statistics were calculated for each subject area and for each year under investigation. Mean system NCEs were computed for each year. Differences in achievement by year for all systems combined were investigated using analysis of variance, complete randomized block design; where school systems were blocked. From this analysis a significant effect for years was indicated and Tukey's Honestly Significant Difference Method was used to test the differences in means across years.

Procedures - Analysis 2

To investigate differences in achievement by type of system, the mean system NCE for Total Reading in 1975 was used to stratify the school systems. Systems were designated as high-achieving systems if the system mean NCE was one standard deviation or more above the state mean NCE and were designated as low-achieving systems if the system mean NCE was one standard deviation or more below the state mean NCE. The same strata were used for all analyses.

Descriptive statistics were calculated for each subject area and for each year under investigation for each type of system. The differences in achievement by year and by type of system (high achieving, average achieving, low achieving) were analyzed using an analysis of variance, split plot factorial design. The type of system was analyzed across years with systems blocked within type. In this design, systems were nested within type and the analysis was conducted to estimate the effects for years, type of system, and the interaction of these two.

From these analyses, a significant interaction between years and type of system was detected. In this study, the differences among means within type of system across years would indicate changes in student achievement. The simple effects from the interaction were tested (α= .05) to determine if there were significant differences in mean scores across years within each type of system. These analyses revealed significant differences for each grade and each subject for each type of system. Because of these results, Tukey's Honestly Significant Difference Method was used to test the differences in means by type of system across years. The differences in the means of the high-, average-, and low-achieving systems within a particular year were not an issue under investigation in this study; therefore, no post hoc comparisons were made for the differences in means by type of system within a year.

Procedures - Analysis 3

To investigate differences in achievement by type of student, the student's Total Reading score in 1981 was used to classify students as above average, average or below average. Students were classified as above average if their NCE was above 65.6 (77th percentile) and were

classified as below average if the NCE was below 34.4 (23rd percentile). The same strata were used for all analyses.

Descriptive statistics were calculated for each subject area and for each year under investigation for each type of student. Changes in achievement levels for the three types of students were analyzed using an analysis of variance, split plot factorial design, with students blocked within type. A second analysis was conducted in which students were classified as above average, average, or below average for each year so that changes in the percent of students within each classification could be investigated.

From the analysis of variance, a significant interaction between years and type of student was detected. The simple effects from the interaction were tested (α=.05) to determine if there were significant differences in mean scores across years within each type of student. These analyses revealed significant differences for each year and each subject for each type student. Tukey's Honestly Significant Difference Method was used to test the differences in means by type of student across years.

From the second analysis, the percent of students within each classification for each year indicated that there was a consistent increase in the percent of students classified as above average in each year and a consistent decrease in the percent of students classified as below average in each year.

RESULTS

There appeared to be a significant change in student achievement concomitant with the initiation of the BCE program. This was true when systems were considered and state averages were used. It was also true

when systems were stratified into three achievement levels. In the years prior to the initiation of the BCE program there was no significant change in achievement from one year to the next. In the years following the initiation of the BCE program, there were significant increases in the achievement levels and this upward trend continued through 1984.

The results of the first analysis were consistent for all grades and all subjects and indicated significant differences between the means of the post-initiation years and the pre-initiation years. In the post data, there was a significant difference and an increase in test scores for each succeeding year resulting in all subject areas in every grade being above the national average except 10th-grade reading which was at the 49.46 NCE. Means for pre-initiation years showed no significant differences between years. The means and standard deviations for all systems combined are presented in Table 1. A summary of the analyses of variance for each grade and subject is presented in Table 2*.

There was a dramatic upward shift in means between the pre-initiation and post-initiation years. It was expected that there may be an initial increase in scores due to a possible Hawthorne effect associated with the implementation of the program. The shift was not temporary, however, and means continued the upward trend lending support to a more permanent change than expected. Figures 1-3 illustrate the changes in statewide achievement that occured during the years under investigation.

*Because of the volume of analyses, all Tables are not presented in the paper. The results of the post hoc comparisons are reported but the tables have been excluded. All tables are available from the authors upon request.

The results of the second analysis indicated that significant changes were occuring in mean achievement from pre-initiation years to post-initition years in all three achievement strata. Descriptive statistics for each type system for each subject area and year under investigation are presented in Tables 3-5. A summary of the analyses of variance is indicated in Table 6. The high-achieving systems were within five NCEs of the national average during the pre-initiation years in all subjects and grades. By 1984, all means were above an NCE of 60 except 10th grade reading which was an NCE of 59.16. The means for the average-achieving systems in all subjects and grades were below the national average during the pre-initiation years and ranged from an NCE of 36 to an NCE of 46. In 1984, all means for the average-achieving group were above the national average. During the pre-initiation years, the means for all subjects and grades for low-achieving systems did not exceed an NCE of 37 and had a low NCE of 23.59 (the 10th percentile). By 1984, these means had increased to the point where two means, fourth-grade mathematics and language, were above the national average, and all remaining means were above an NCE of 41 (the 34th percentile). In general, the fourth- and eighth-grade classes in all three achievement strata had larger increases in means over the years than the tenth grade.

For all grades and subjects, except 10th-grade reading and mathematics, the low-achieving group was achieving in 1981 where the average-achieving group performed in 1976. By 1984, the low-achieving group was well above the pre-initiation level of the average-achieving group and, in 7 out of 9 cases, was either above the national average or within 3 NCEs of the national average. The average-achieving group in post-initiation years performed where the high-achieving group scored

during pre-initiation years and in five cases were well above the performance of the high-achieving systems in 1975 and 1976. The high-achieving systems jumped significantly above where performance had been in pre-initiation years and continued the upward trend. Figures 4-12 show the changes in achievement, by type of system, for each subject area.

The results of the third analysis, conducted at the student level, showed a less consistent pattern than the results for system level data. Whereas, the system level analyses showed steadily increasing scores from year to year, the student level analysis evidenced a decrease in scores from 1981 to 1983 and an increase in scores from 1983 to 1984. The amount of decrease and recovery varied by subject area. The means, standard deviations, and number of students analyzed are presented in Table 7.

Students were classified into the three strata based on their Total Reading score in 1981, when the students were in grade 2. These same classificaions were used to evaluate changes in achievement in Mathematics and Language. Since the same students were evaluated for each year under investigation, the students' data were collected in 1983 and 1984 (in grades 4 and 5). The percent of students within each classification from this sample was consistent with the percent within each classification for the entire population.

In Reading, the mean NCE for high-achieving students decreased from 79.98 in 1981 to 69.09 in 1983, but then increased to 71.48 in 1984. This decrease in Reading scores from 1981 to 1983 was the largest for any subject area for any type student. The Mathematics and Language scores also evidenced a decrease in mean scores from 1981 to 1983 with a recovery from 1983 to 1984. In Mathematics, however, the gain in 1984 was almost back to the 1981 level and in Language the recovery was to a level above

the 1981 performance. The pattern of a decrease from 1981 to 1983 followed by an increase can also be seen in students classified as average-achieving students. The decreases are much less, however, and the recovery is above 1981 levels for two of the three subject areas. For low-achieving students, there is a consistent increase in scores for Reading and Language. In Mathematics, however, the pattern is similar to the performance of average-achieving students. The summary of the analyses of variance is indicated in Table 8.

Although not reported herein, a second matched sample of students in grades 7, 8, and 10 was collected and analyzed. The results for this second sample were consistent with the results reported for the sample of students in grades 2, 4 and 5.

In the second analysis undertaken to evaluate the achievement of students after the initiation of the BCE program, the number and percent of students classified as above average, average, and below average were collected for each subject area and year under investigation. These data are presented in Table 9. In this analysis, students were classified by their scores in each respective subject area for each year. The results of this analysis showed that in each succeeding year the percent of students classified as above average in each grade remained constant or increased. Conversely, the percent of students classified as below average decreased from year to year.

Given the sizes of each year's classes (approximately 50,000 students per grade) it could be assumed that the scores would be normally distributed. With this assumption, it would be expected that approximately 23 percent of the students would score in the above-average range and 23 percent would score in the below-average range. By 1984, the percent of Alabama students scoring in the above-average range exceeded this expectation and the percent

scoring in the below-average range was well below the expected 23 percent. Thus, even though there was a fluctuation in mean scores for the respective groups, the percent of students scoring higher on the CAT was increasing from year to year. In 1984, 40 percent of second- and fourth-grade students were obtaining CAT scores above the 77th percentile in Language and only 8 percent were below the 23rd percentile.

DISCUSSION

There were many factors that may have contributed to the changes in student achievement during the post-initiation years including the Governor placing an emphasis on test scores across the grade levels and the use of these scores for evaluating schools and school systems. The Basic Competency Education Program implemented by the State Board of Education created extensive curriculum evaluation, revision, and, in some cases, initial development to assure that these basic skills were being taught.

All of these factors, as well as some unknown factors, may have and probably did contribute to the gains in student achievement found in this study. It should be noted, however, that none of these other factors had the broad impact on the curriculum that the BCE program had. This impact notwithstanding, no direct single casual reltionship between the BCE program and student achievement should be inferred.

In investigating the system means through the years for each achievement strata, it can be seen that low-achieving systems have been positively influenced as might be expected by both advocates and opponents of minimum competency testing. The average-achieving systems also were positively influenced which may or may not have been expected. More significantly, and in direct contrast to many opponents of minimum competency testing, is the

fact that high-achieving systems also had a significant increase in scores and that these scores have continued to rise through the post-initiation years. In fact, in seven of nine cases, means for the high-achieving systems were decreasing during pre-initiation years; whereas, post-initiation data show significant initial increases in mean scores and a continuing upward trend during post-initiation years. Five of those cases may possibly be explained by the phenomenon of regression towards the mean; however, the pre-initiation means for eighth-grade reading and language were below the national average and actually decreased during those years. This decreasing trend reversed, and the same significant increase can be seen in all areas that formerly were decreasing. In addition, means for the high-achieving group are well above the national average in post-initiation years, yet there is no evidence of regression toward the mean.

The investigation of individual student performance indicated that mean test scores for all types of students varied during post-initiation years; and while these means decreased during the initial years of the program, all means increased during the final year under investigation. This recovery, coupled with the fact that more and more students were scoring in the above-average range would indicate that the BCE program does not appear to be systematically suppressing the achievement of high achieving students. Thus, it appears that an emphasis on the acquisition of minimum skills does not necessitate a decrease in the motivation for students who have mastered the basic skills to acquire higher-order skills.

CONCLUSIONS

Popham (1981) has maintained that a "high-quality MCT program will have decisively positive effects on students, on the curriculum and teaching, and on public perceptions of schooling" (p. 89). Alabama's Basic Competency Education program was developed by Alabama educators and lay citizens. Minimum skills were determined by educators and the tests were written by appropriate grade-level teachers. The program was phased in slowly with major emphasis on total curriculum development to ensure the teaching of the basics along with other essential skills as well as on the reteaching of basic skills to those students deficient in certain areas. The characteristics defined by Popham (1981) that distinguished high quality minimum competency programs describe the Alabama Basic Competency program.

Although there were many factors that may have contributed to the rise in achievement noted in post-initiation years, the BCE program was significant among them. The results of this study appear to indicate that the BCE program has, at best, a positive effect on achievement and, at least, a nonnegative effect. It has been stated that "minimum levels will be perceived as maximums, causing a plateau effect on the distribution of achievement test scores" (Jarolimek & Foster, 1981, p. 26). There has been a long held fear that an emphasis on minimum skills would become maximum expectations for students resulting in a decrease in achievement for average and above average students. These suspicions are not supported by these data. Since the initiation of the BCE program in Alabama, there has been no plateau effect or negative effect on overall student achievement for the state as a whole or for systems and students identified as high achieving, average achieving, and low achieving. In fact, the data in this study support the contention that a quality BCE program has a positive relationship with overall student achievement.

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Table 1

Means and Standard Deviations for Each Subject, Grade, and Year

		1974		1975		1976		1979		1981		1983		1984	
		X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD
Grade 4	Reading	40.7	**	43.02	7.04	43.37	7.11	48.21	7.34	50.83	6.83	51.68	6.10	53.48	6.10
	Mathematics	39.0	**	41.79	6.49	41.83	6.39	50.69	7.29	53.70	6.51	54.92	5.86	57.09	6.01
	Language	43.6	**	44.54	6.90	44.45	6.93	51.01	7.98	55.01	7.89	56.53	6.93	59.29	6.75
Grade 8	Reading	35.1	**	35.80	6.53	36.17	5.92	47.60	7.38	49.51	7.19	51.29	6.75	52.38	6.01
	Mathematics	44.1	**	45.20	7.24	45.06	6.87	49.24	7.68	51.24	6.62	54.13	5.75	55.81	5.46
	Language	37.1	**	37.54	6.21	37.89	5.85	49.13	8.87	51.61	7.87	55.39	7.02	56.89	6.56
Grade 10	Reading	46.3	**	44.65	6.64	44.77	6.88	45.85	8.33	47.79	7.45	48.92	7.33	49.46	7.56
	Mathematics	44.1	**	43.62	7.35	43.82	7.69	46.02	7.61	47.98	7.15	51.84	6.39	53.21	6.06
	Language	42.5	**	42.36	6.57	42.58	7.16	50.74	9.89	52.55	8.15	54.86	7.62	56.57	7.35

**In 1974, only the state average was available. Standard deviations, therefore, could not be calculated.

N = 128 systems.

Table 2

Analysis of Variance, Randomized Block Design

Reading

	Grade 4		Grade 8		Grade 10	
Source	Mean Squares	F	Mean Squares	F	Mean Squares	F
Systems	240.111	37.84*	238.68	47.43*	296.415	60.57*
Years	2397.330	372.76*	7172.482	1425.23*	544.765	111.31*

Mathematics

	Grade 4		Grade 8		Grade 10	
Source	Mean Squares	F	Mean Squares	F	Mean Squares	F
Systems	194.971	18.91*	224.261	28.46*	253.88	32.71*
Years	5595.488	524.67*	2551.079	323.76*	2029.83	261.51*

Language

	Grade 4		Grade 8		Grade 10	
Source	Mean Squares	F	Mean Squares	F	Mean Squares	F
Systems	259.452	24.80*	256.848	27.36*	313.529	32.18*
Years	4931.177	471.89*	9108.937	970.19*	4555.047	467.52*

* F-ratio significant at the .05 level.

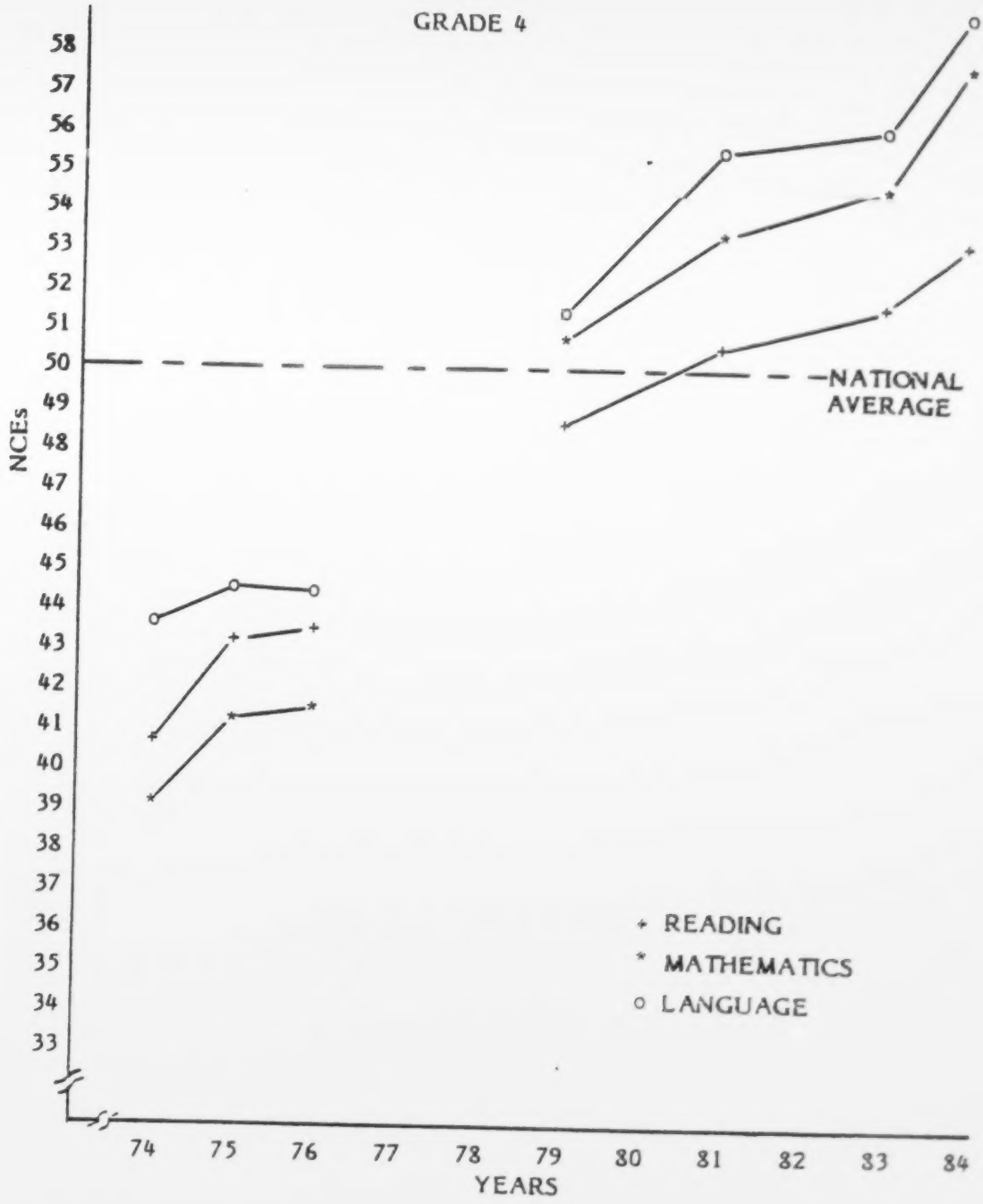

Figure 1. State achievement trends in grade 4 before and after the initiation of the Basic Competency Education program.

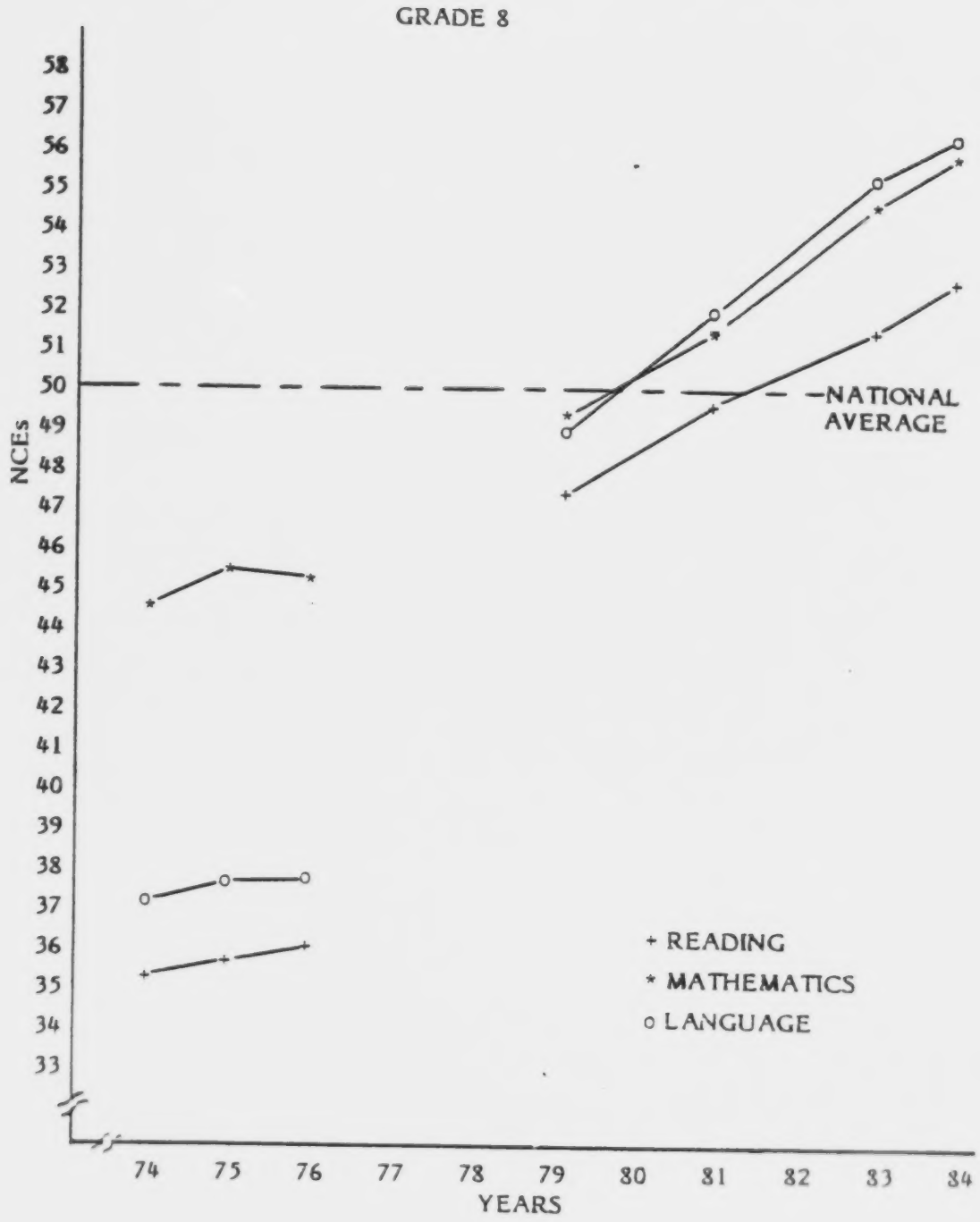

Figure 2. State achievement trends in grade 8 before and after the initiation of the Basic Competency Education program.

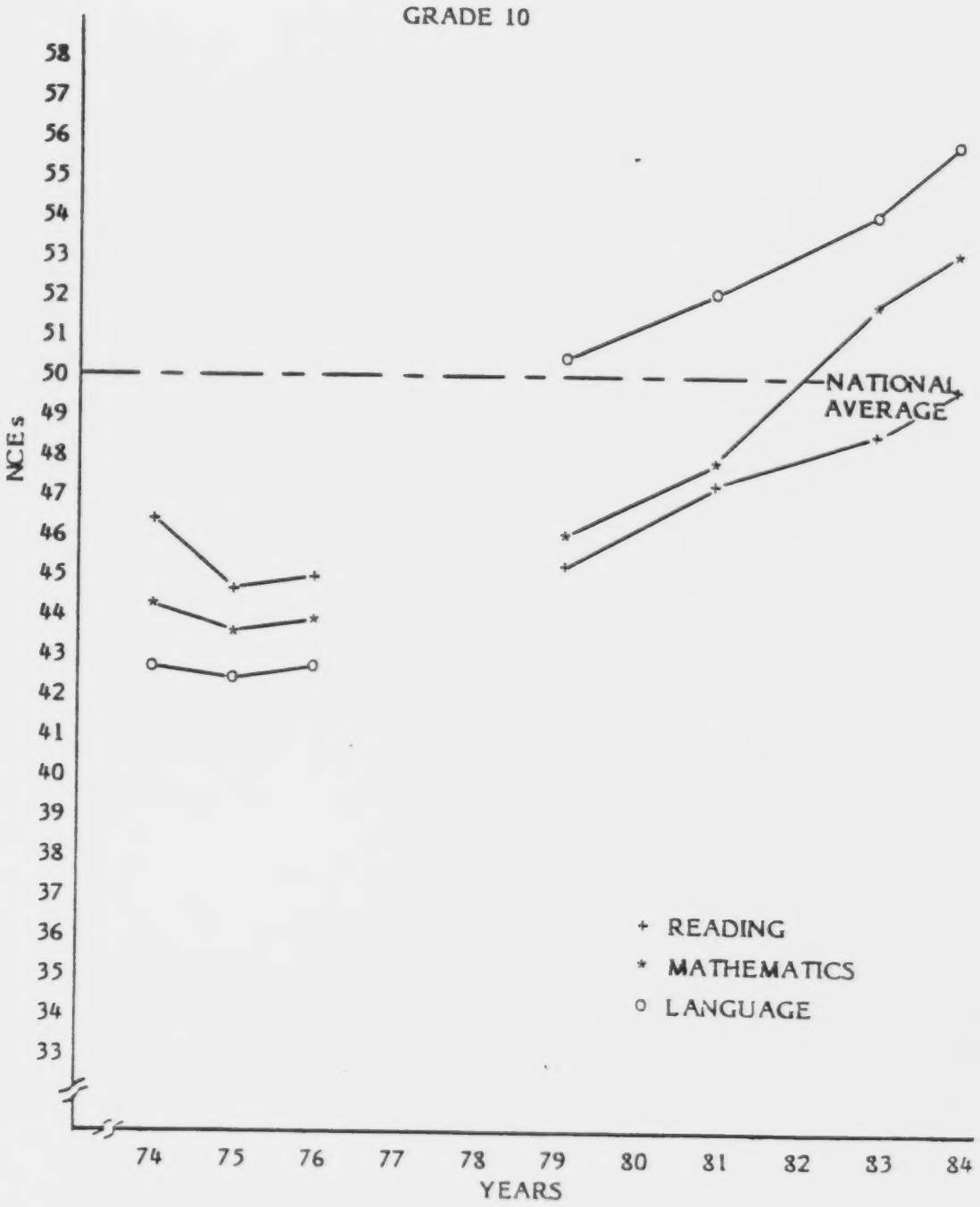

Figure 3. State achievement trends in grade 10 before and after the initiation of the Basic Competency Education program.

Table 3

Means and Standard Deviations for Each Subject, Grade, and Year for High-Achieving Systems

Grade	Subject	N*	Years									
			1975		1976		1981		1983		1984	
			X	SD	X	SD	X	SD	X	SD	X	SD
4	Reading	15	54.29	4.18	53.05	5.89	60.47	6.81	60.23	6.25	61.63	6.31
	Mathematics	15	51.73	4.36	49.53	5.84	62.64	6.72	61.68	6.79	62.65	6.98
	Language	15	53.01	4.71	51.78	5.92	64.67	7.74	64.54	7.06	67.63	6.47
8	Reading	11	45.82	3.22	44.98	4.20	61.20	6.19	62.80	5.97	61.71	5.59
	Mathematics	11	55.04	2.79	54.45	5.91	62.58	7.05	63.19	6.79	63.37	7.32
	Language	11	46.55	3.29	45.83	2.84	63.37	6.24	65.28	5.52	65.71	5.77
10	Reading	15	54.07	3.49	54.09	3.83	58.38	5.26	58.95	5.88	59.16	6.28
	Mathematics	15	53.51	3.45	53.00	3.94	58.17	5.30	60.22	6.34	61.50	5.49
	Language	15	50.50	3.36	51.58	4.32	63.77	5.92	64.92	6.35	65.89	6.07

*The number of systems may vary slightly across years due to missing data.

Table 4

Means and Standard Deviations for Each Subject, Grade, and Year for Average-Achieving Systems

Grade	Subject	N*	Years									
			1975		1976		1981		1983		1984	
			X	SD	X	SD	X	SD	X	SD	X	SD
4	Reading	91	43.40	3.63	43.63	4.10	51.04	4.20	51.85	3.79	53.51	4.34
	Mathematics	91	41.99	4.18	41.92	4.51	53.37	4.79	54.83	4.61	57.03	5.44
	Language	91	45.30	4.11	45.01	4.55	55.49	5.69	56.95	4.90	59.54	5.29
8	Reading	93	36.67	2.97	37.04	3.13	50.25	4.35	52.04	3.41	53.12	3.38
	Mathematics	93	46.25	4.21	45.91	4.48	51.65	5.08	54.53	4.14	56.22	3.67
	Language	93	38.39	3.41	38.62	4.09	52.46	4.01	56.45	3.49	57.76	4.31
10	Reading	84	45.28	3.23	45.58	3.70	48.51	4.26	49.68	4.27	50.34	4.16
	Mathematics	84	44.30	4.02	44.81	4.43	48.51	4.33	52.43	3.65	53.60	4.33
	Language	84	42.97	4.11	43.38	4.22	53.14	4.91	55.56	4.72	57.16	3.57

*The number of systems may vary slightly across years due to missing data.

Table 5

Means and Standard Deviations for Each Subject, Grade and Year for Low-Achieving Systems

Grade	Subject	N*	Years									
			1975		1976		1981		1983		1984	
			X	SD	X	SD	X	SD	X	SD	X	SD
4	Reading	22	31.66	5.02	34.93	8.63	43.01	6.91	45.15	6.39	47.02	5.16
	Mathematics	22	32.46	3.79	35.62	7.59	48.75	5.95	50.69	5.85	53.54	4.83
	Language	22	33.65	6.88	36.44	8.78	46.03	7.75	49.33	7.27	52.59	5.54
8	Reading	19	23.59	7.11	26.63	6.11	38.81	5.65	41.33	6.51	43.66	5.74
	Mathematics	19	32.05	5.81	35.29	7.24	42.58	5.81	47.14	6.91	49.64	5.31
	Language	19	26.24	7.16	29.54	5.66	40.32	7.02	44.88	5.91	47.83	6.29
10	Reading	28	32.48	4.11	36.83	8.18	39.67	7.72	41.26	7.67	41.59	8.59
	Mathematics	28	30.74	5.66	35.37	9.88	40.66	7.39	45.56	6.95	47.61	6.74
	Language	28	30.79	4.54	34.86	8.83	44.49	9.07	47.37	8.09	49.77	8.82

*The number of systems may vary slightly across years due to missing data.

Table 6

Analysis of Variance, Split Plot Design, Systems

Reading

Source Years	Grade 4 Mean Squares	Grade 4 F	Grade 8 Mean Squares	Grade 8 F	Grade 10 Mean Squares	Grade 10 F
At High	234.06	50.33*	894.39	290.39*	100.77	40.97*
At Average	2085.18	488.43*	6676.04	2167.54*	456.84	185.71*
At Low	914.69	196.71*	1482.39	481.29*	285.33	115.99*

Mathematics

Source Years	Grade 4 Mean Squares	Grade 4 F	Grade 8 Mean Squares	Grade 8 F	Grade 10 Mean Squares	Grade 10 F
At High	626.98	79.97*	229.18	41.44*	219.44	57.29*
At Average	4821.79	615.02*	2170.92	392.57*	1521.59	397.28*
At Low	1799.84	299.57*	1033.17	186.83*	1072.37	279.99*

Language

Source Years	Grade 4 Mean Squares	Grade 4 F	Grade 8 Mean Squares	Grade 8 F	Grade 10 Mean Squares	Grade 10 F
At High	811.53	94.25*	1150.54	189.54*	855.01	250.73*
At Average	4204.77	488.36*	8890.58	1464.68*	3871.67	1135.39*
At Low	1351.64	156.99*	1636.19	269.55*	1893.08	555.16*

* F-ratio significant at the .05 level.

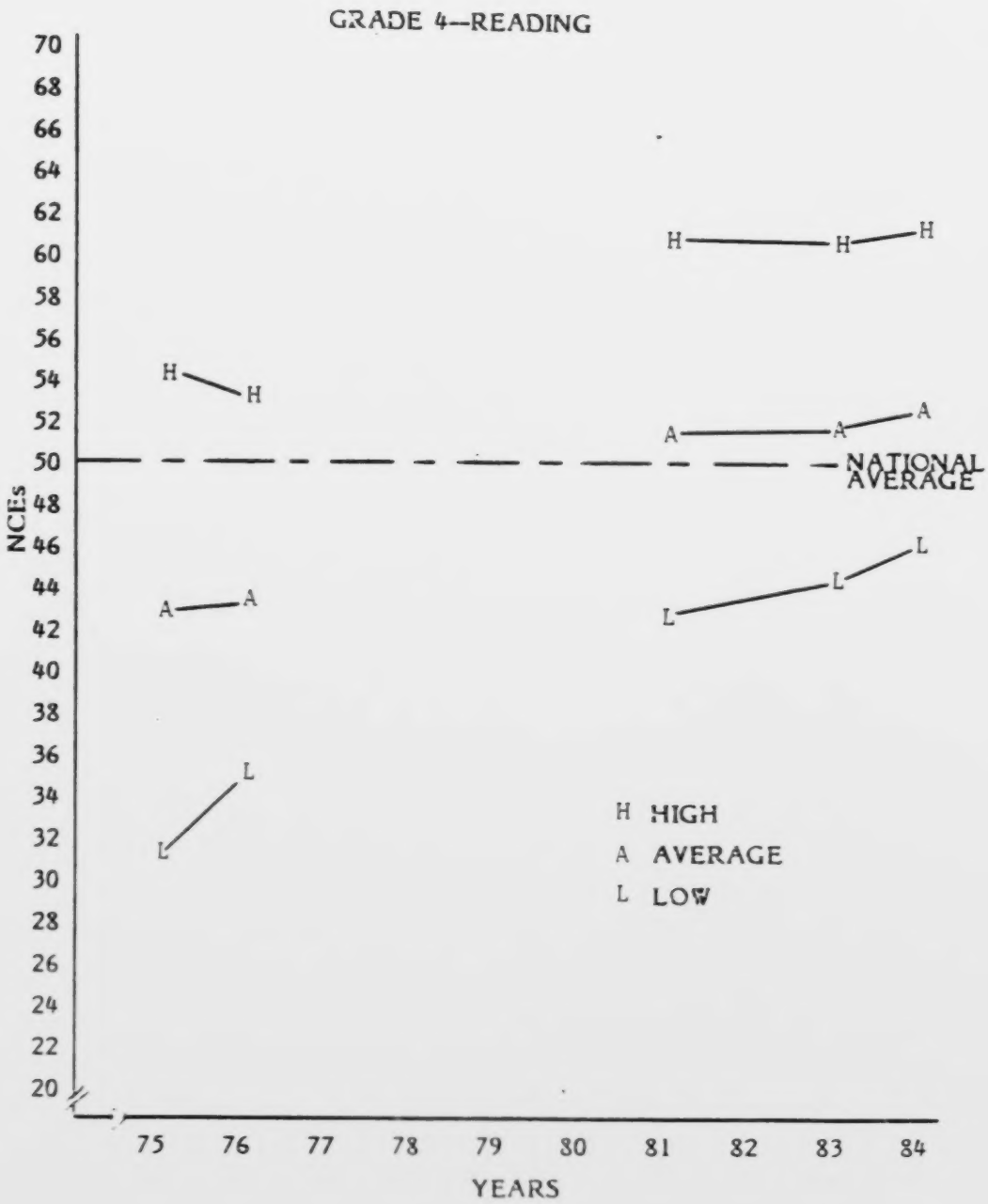

Figure 4. Grade 4 achievement by type of system across years in reading.

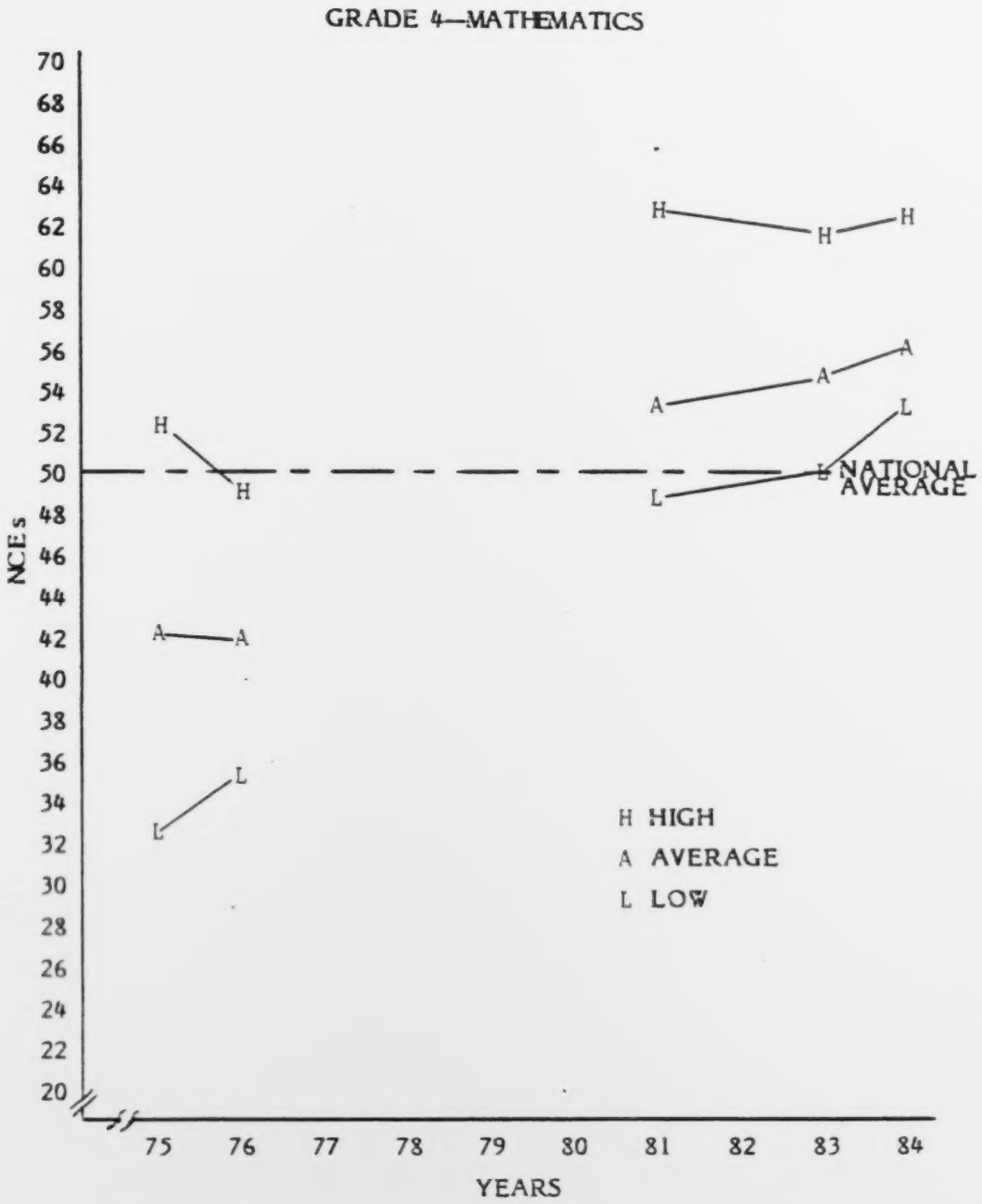

Figure 5. Grade 4 achievement by type of system across years in mathematics.

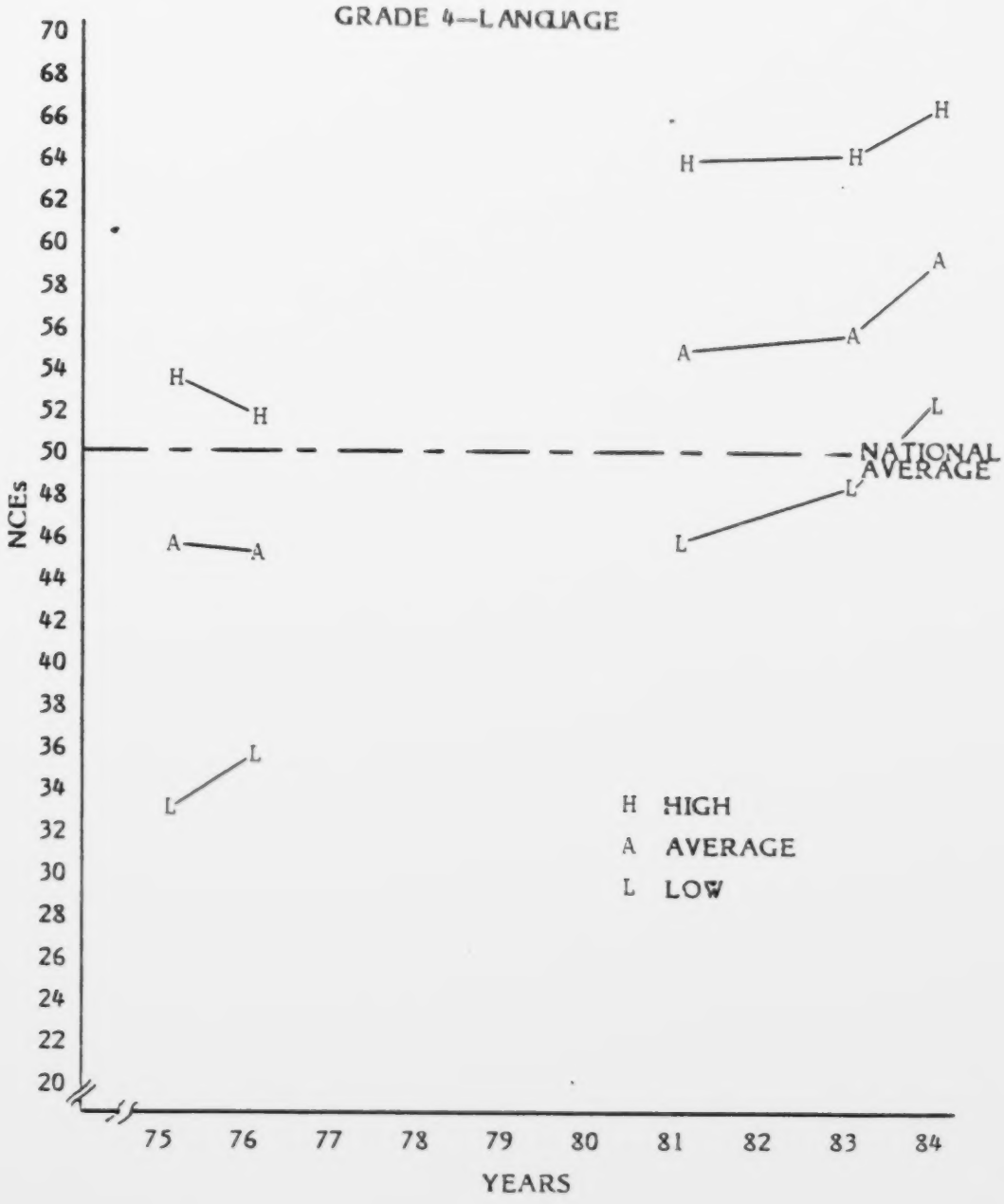

Figure 6. Grade 4 achievement by type of system across years in language.

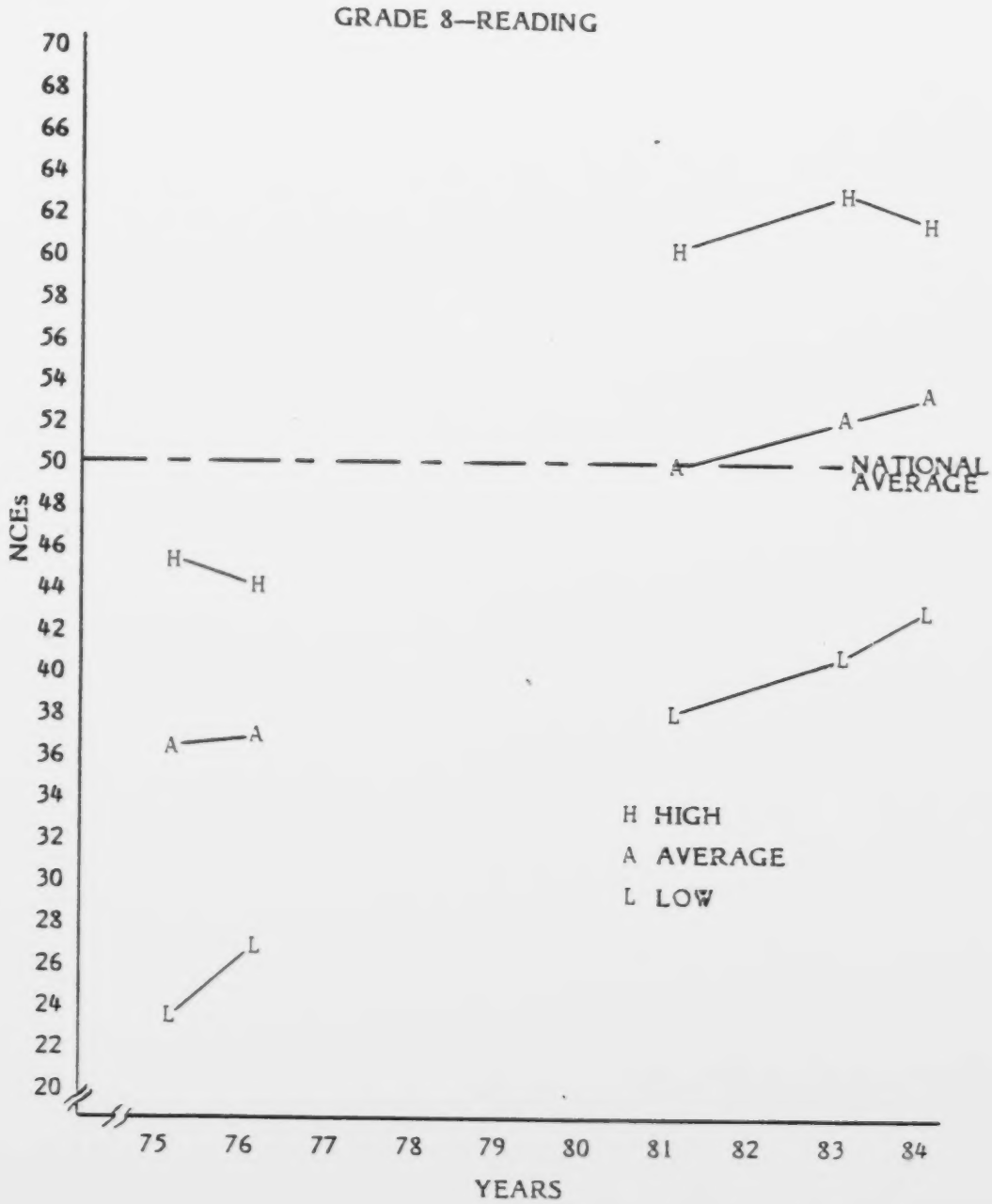

Figure 7. Grade 8 achievement by type of system across years in reading.

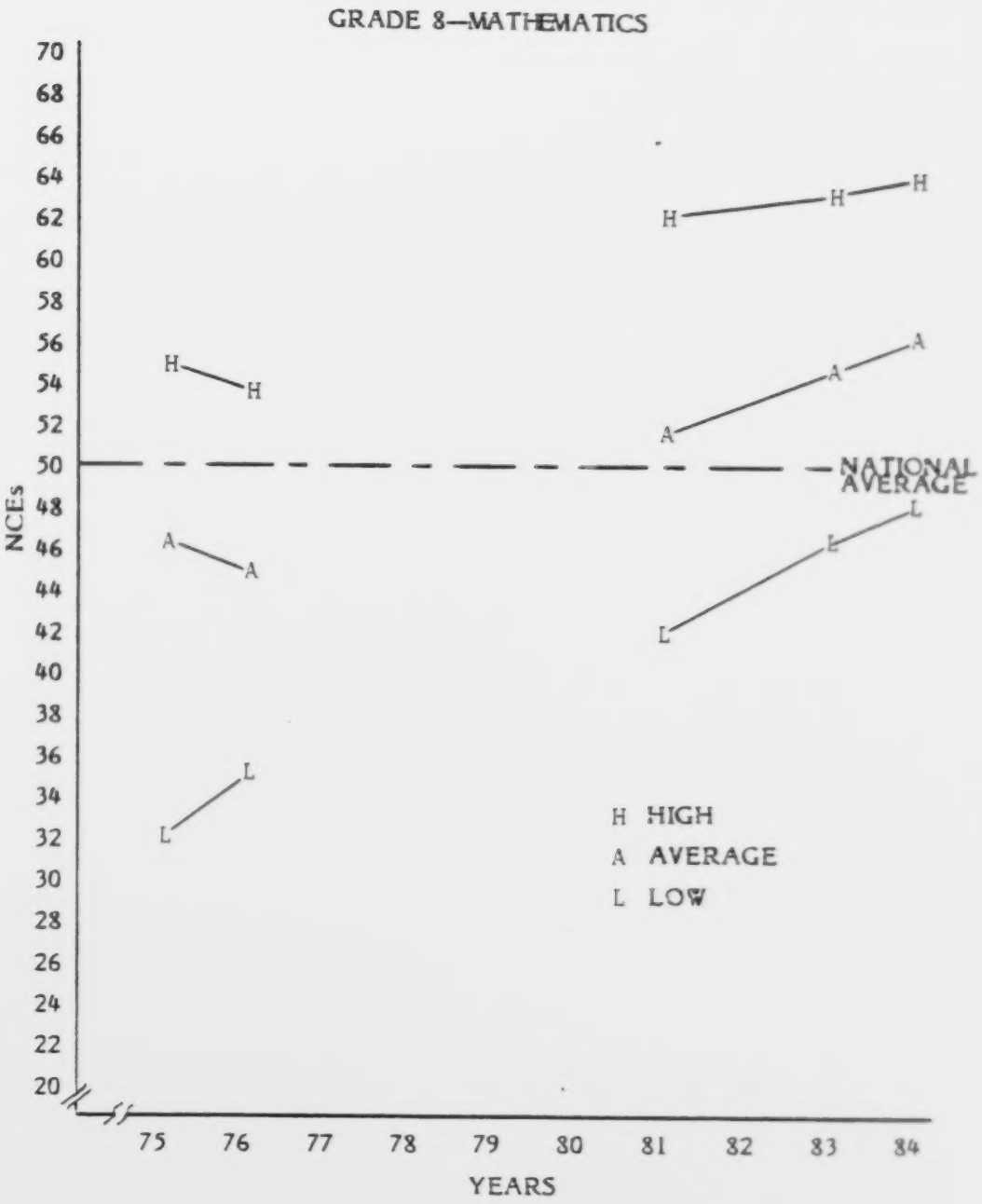

Figure 8. Grade 8 achievement by type of system across years in mathematics.

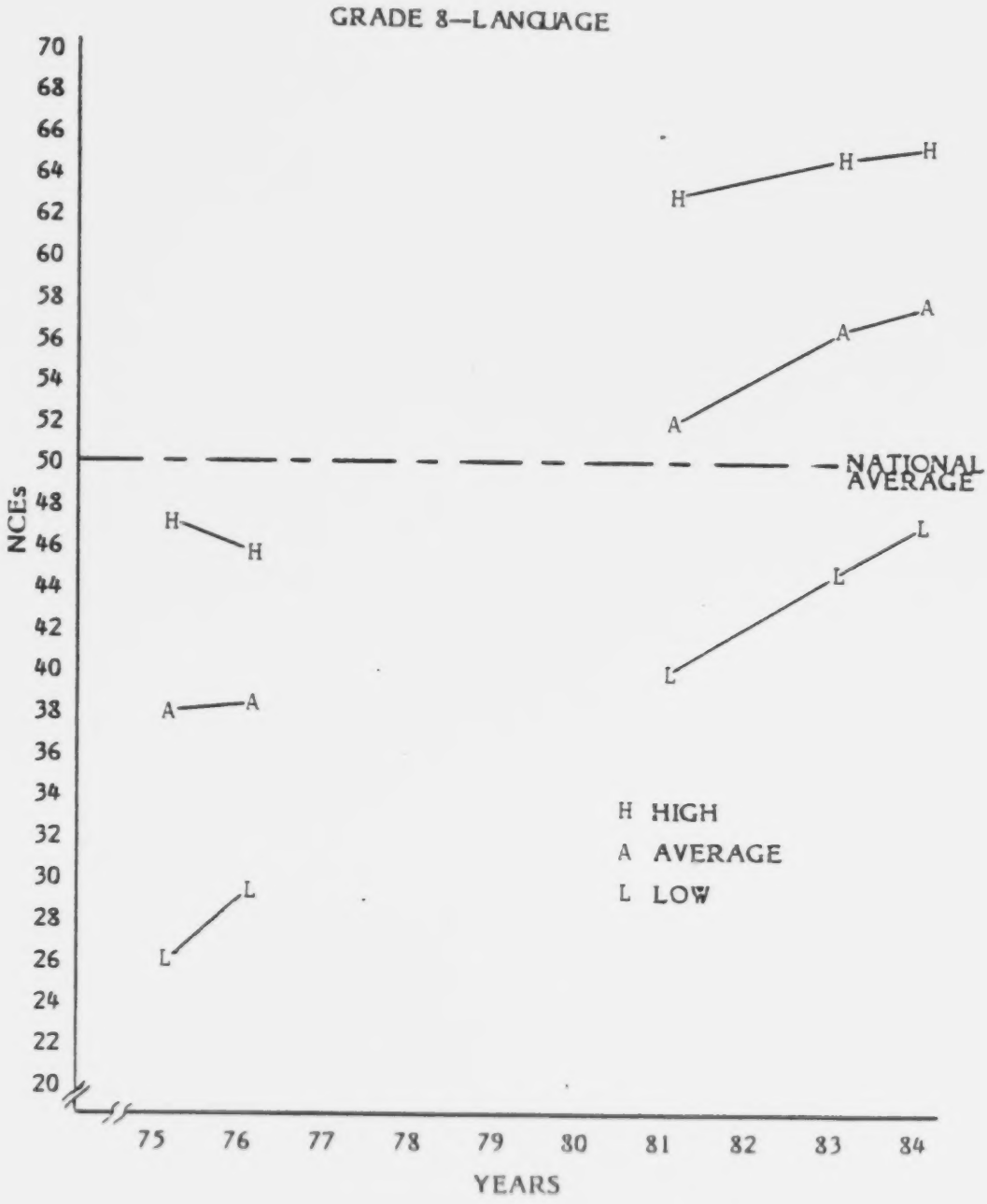

Figure 9. Grade 8 achievement by type of system across years in language.

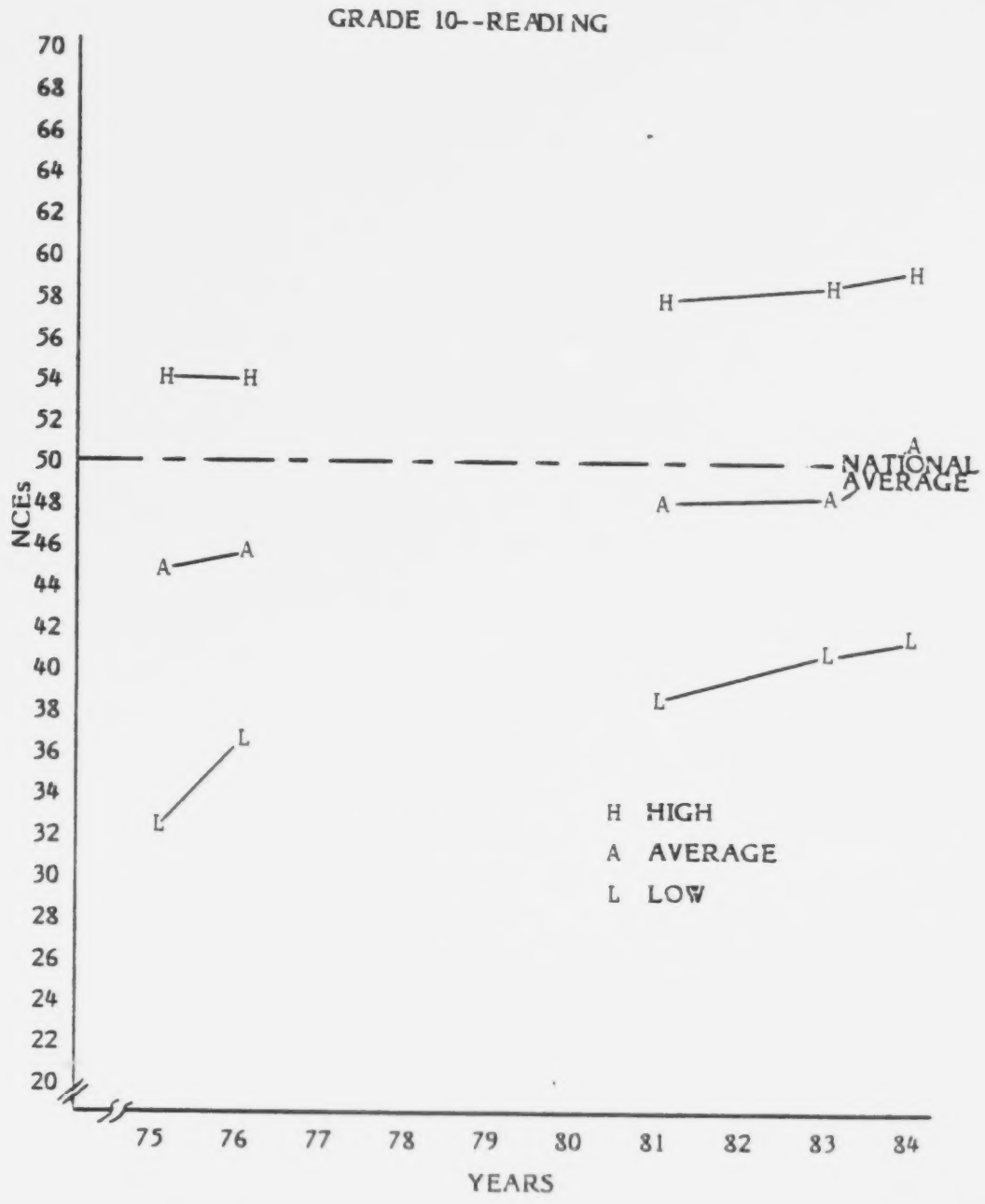

Figure 10. Grade 10 achievement by type of system across years in reading.

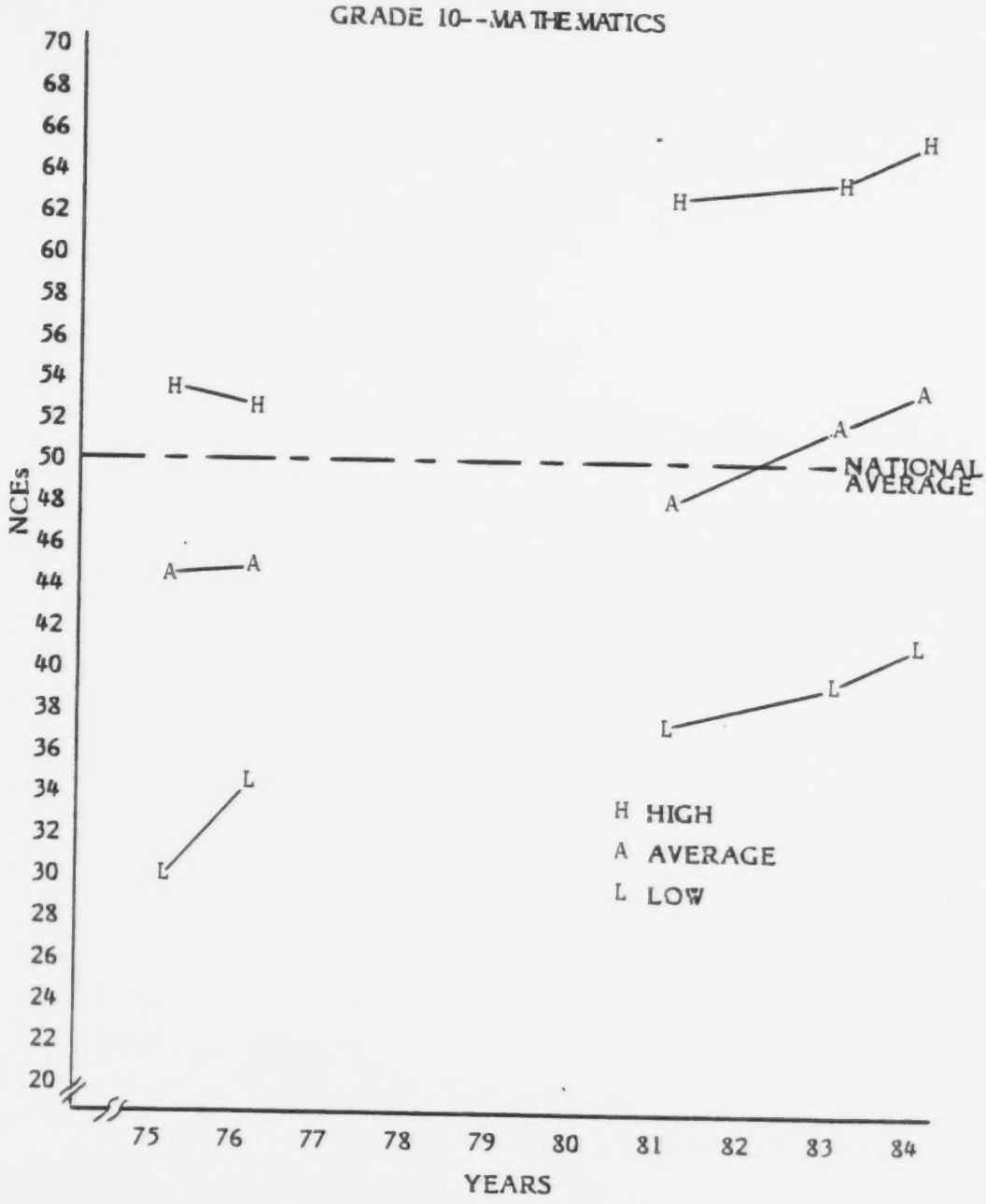

Figure 11. Grade 10 achievement by type of system across years in mathematics.

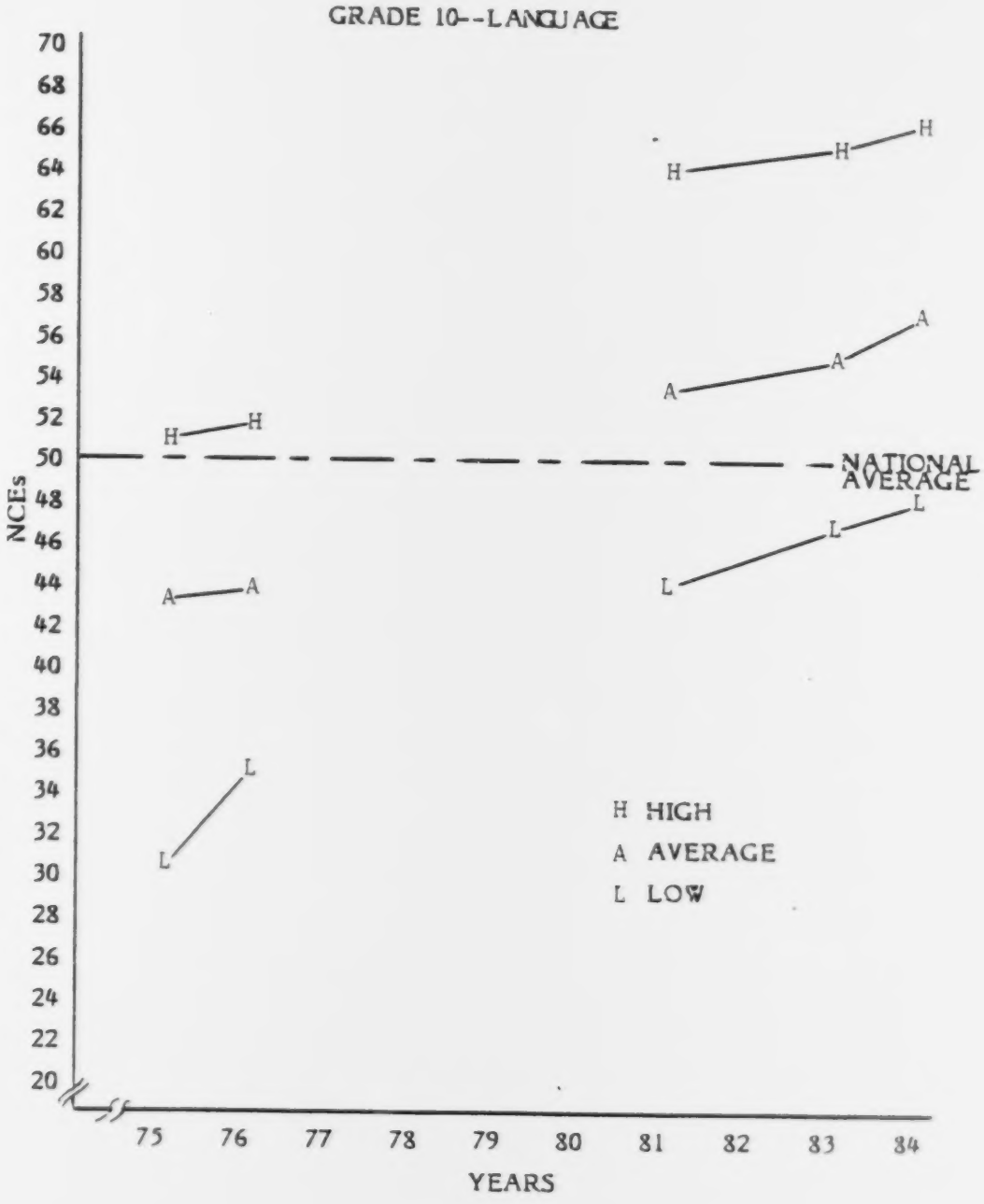

Figure 12. Grade 10 achievement by type of system across years in language.

Table 7

MEANS, STANDARD DEVIATIONS, AND SAMPLE SIZE
BY TYPE OF STUDENT AND SUBJECT AREA

READING

	HIGH			AVERAGE			LOW		
	MEAN	S.D.	N	MEAN	S.D.	N	MEAN	S.D.	N
1981	78.98	9.32	5493	49.95	8.07	11385	24.18	8.32	2113
1983	69.09	14.05	5457	49.91	13.26	11313	31.75	12.31	2085
1984	71.48	14.49	5456	52.33	14.31	11298	33.53	13.72	2093

MATH

	HIGH			AVERAGE			LOW		
	MEAN	S.D.	N	MEAN	S.D.	N	MEAN	S.D.	N
1981	72.81	12.65	5466	56.69	13.07	11273	40.13	14.19	2092
1983	70.80	15.85	5444	52.92	14.65	11268	37.96	14.14	2083
1984	71.53	15.73	5464	54.39	15.33	11302	39.46	15.23	2091

LANGUAGE

	HIGH			AVERAGE			LOW		
	MEAN	S.D.	N	MEAN	S.D.	N	MEAN	S.D.	N
1981	77.05	11.73	5473	55.45	14.80	11324	30.85	12.12	2100
1983	75.45	14.44	5449	55.51	15.25	11291	35.80	13.65	2093
1984	77.64	15.22	5453	57.30	15.67	11295	37.74	14.74	2091